

1200V 30mohm Silicon Carbide Power MOSFET
AKCK2M030WAMH

Features:

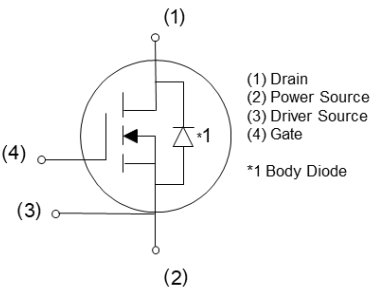
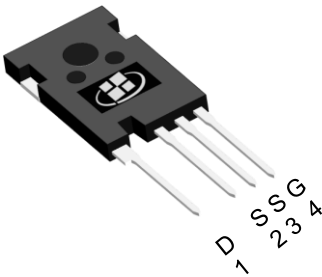
- High-speed switching performance
- low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free, RoHS compliant ^(Note 1)

Applications:

- EV motor drive
- DC/DC converters
- Switched mode power supplies
- Solar inverters
- OBC

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	1200	V
$R_{DS(on)}$, TYP @ $V_{GS} = 18\text{ V}$	30	m Ω
I_D	76	A
P_D	375	W



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKCK2M030WAMH	TO-247-4L	CK2M030WAMH	Tube	300 per box

Notes:

1. Contact ALKAIDSEMI sales for detail information

Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) ^(Note 1)	76	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$) ^(Note 1)	68	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	120	A
V_{GS}	Gate-Source Voltage (dynamic)	-10/+22	V
V_{GS}	Gate-Source Voltage (static)	-6/+18	V
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	375	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	0.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady-State	40	$^\circ\text{C/W}$

Notes:

1. The max drain current limited by maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$		5	50	μA
I_{GSS}	Gate Leakage Current	$V_{GS} = +18\text{ V}, V_{DS} = 0\text{ V}$			100	nA
		$V_{GS} = -6\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 11.5\text{ mA}$	2.2	3.2	4.5	V
		$V_{DS} = V_{GS}, I_D = 11.5\text{ mA}, T_J = 175^\circ\text{C}$		2.2		V
$R_{DS(ON)}$	Drain-Source on-state resistance	$V_{GS} = 18\text{ V}, I_D = 40\text{ A}$	20	30	40	m Ω
		$V_{GS} = 18\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		48		m Ω
G_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 40\text{ A}$		27		S
		$V_{DS} = 20\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		17		S

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, F = 100\text{ kHz}, V_{AC} = 25\text{ mV}$		2940		pF
C_{OSS}	Output Capacitance			129		pF
C_{RSS}	Reverse Transfer Capacitance			15		pF
E_{OSS}	C_{OSS} Stored Energy			54		μJ
R_G	Gate Resistance	$F = 1\text{ MHz}, V_{AC} = 25\text{ mV}$		2.2		Ω
Q_{GS}	Gate-Source Charge	$V_{DS} = 800\text{ V}, I_D = 40\text{ A}, V_{GS} = -5/+18\text{ V}$		34		nC
Q_{GD}	Gate-Drain Charge			35		nC
Q_G	Total Gate Charge			138		nC

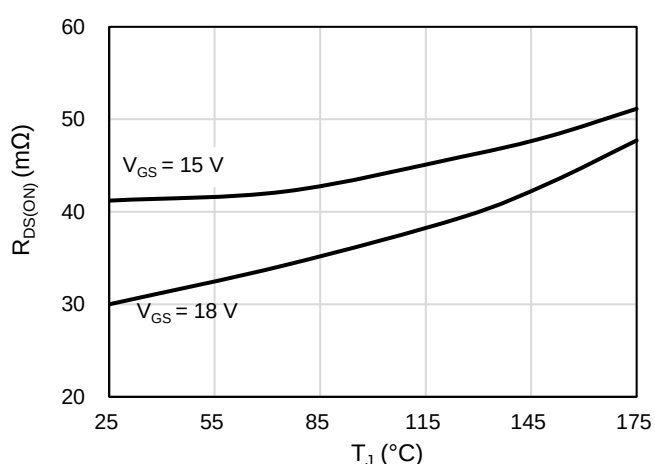
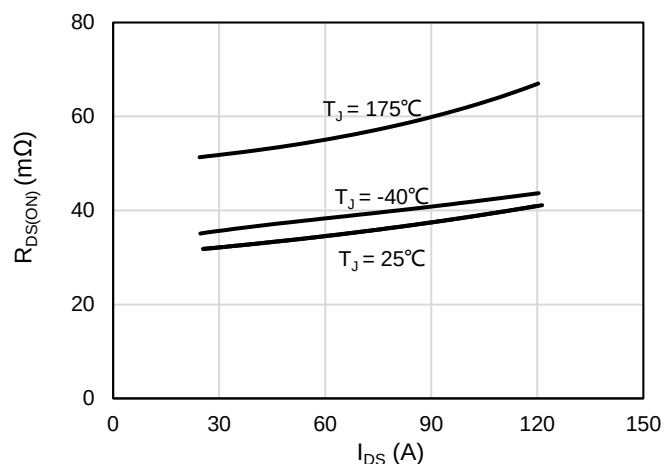
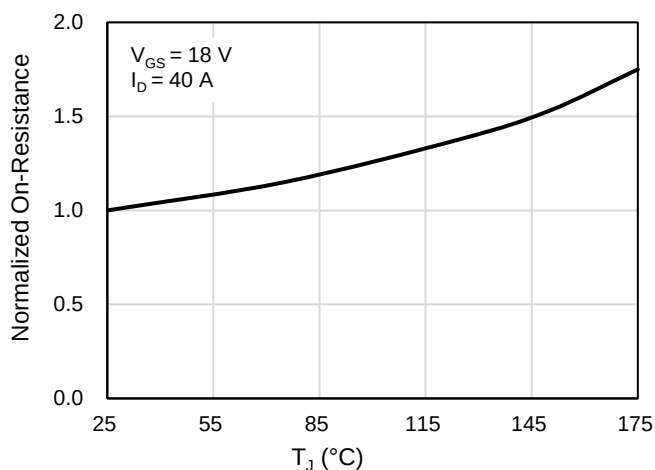
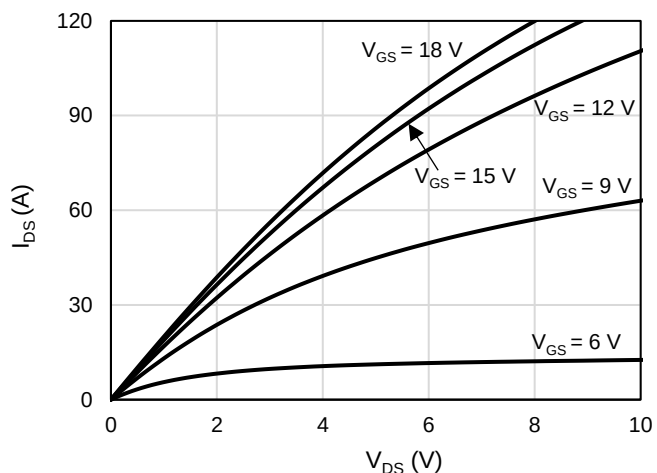
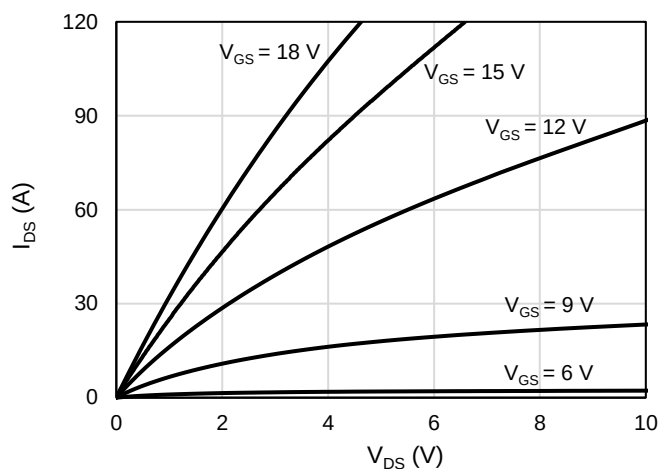
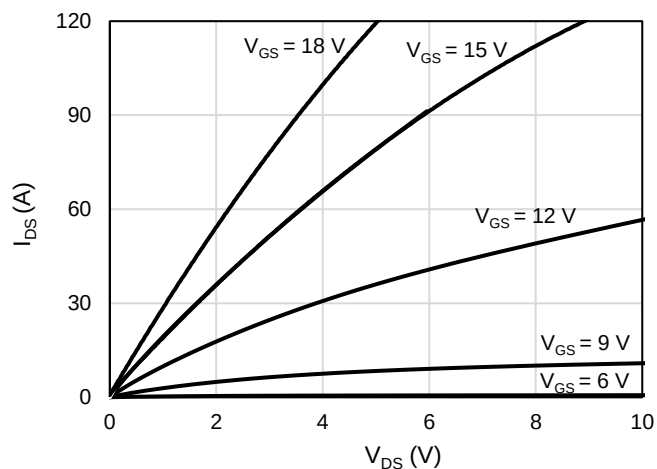
Switching Characteristics (Note3)

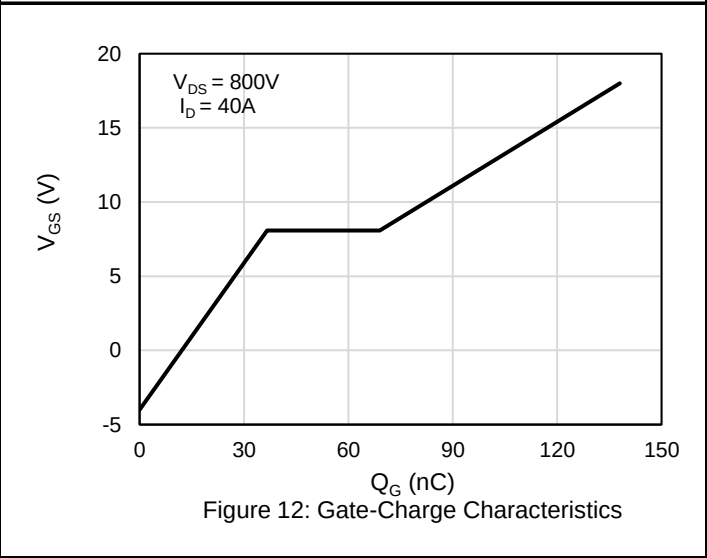
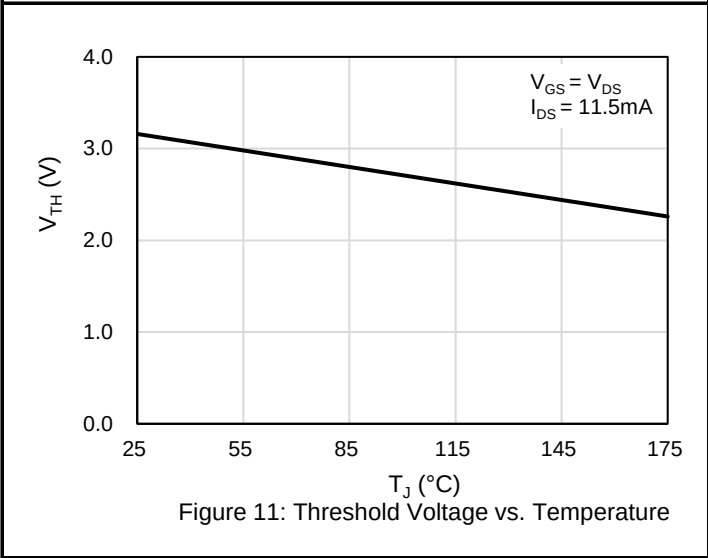
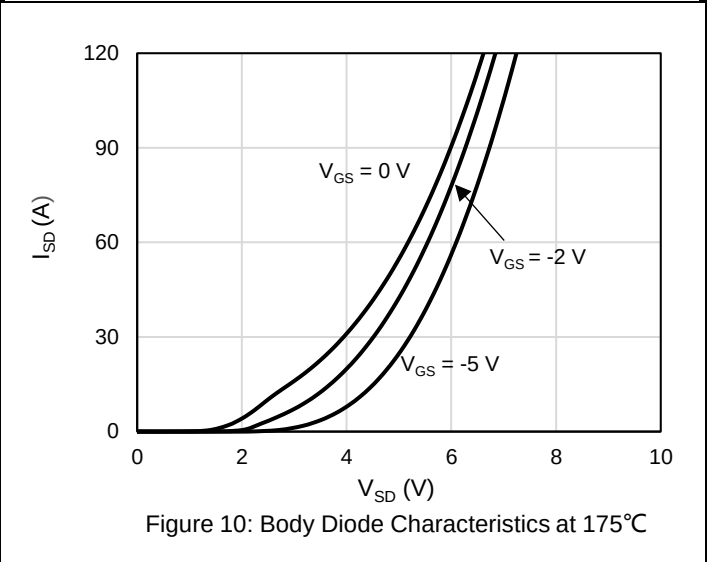
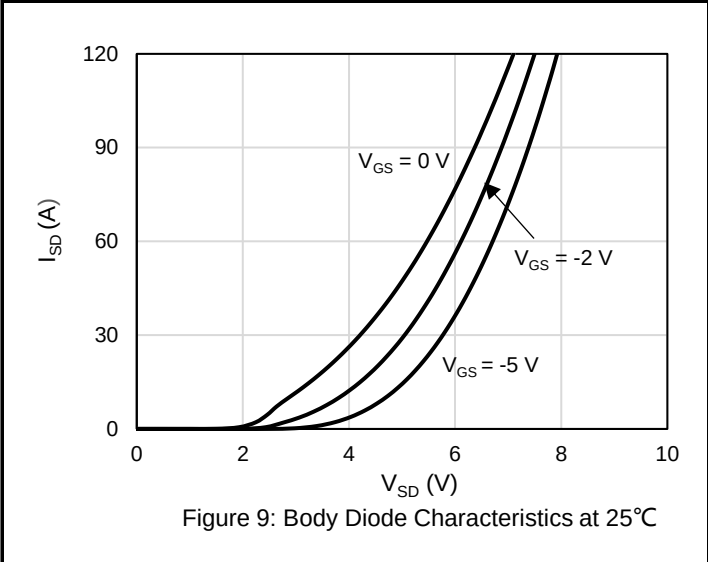
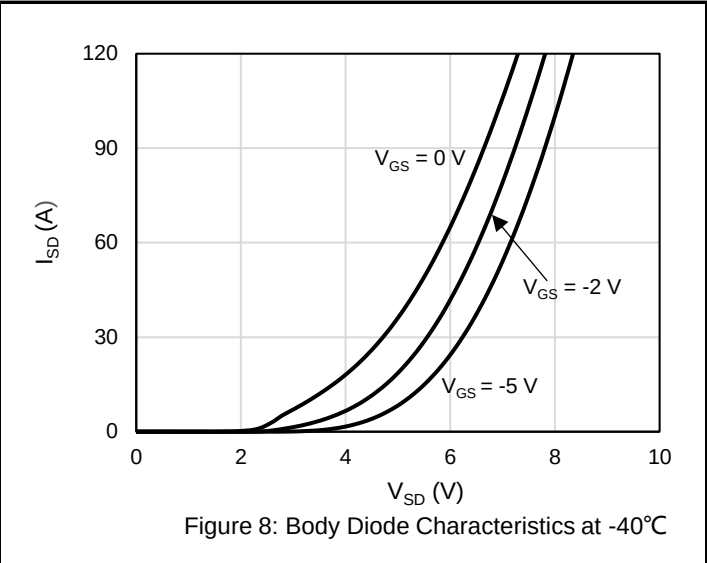
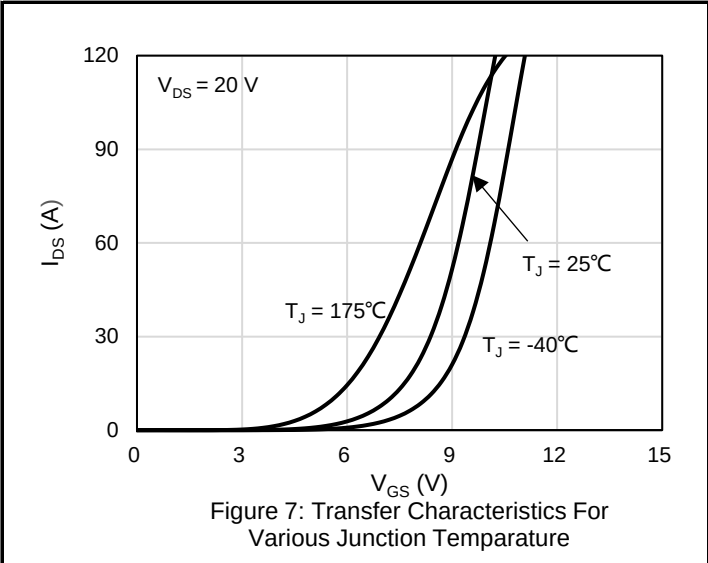
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 800\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = -5/+18\text{ V}$, $R_{G,EXT} = 2.5\ \Omega$ $L = 40\text{ nH}$ Diode: Body Diode at $V_{GS} = -5\text{V}$		12		nS
T_R	Rise Time			10		nS
$T_{D(OFF)}$	Turn Off Delay Time			44		nS
T_F	Fall Time			16		nS
E_{ON}	Turn On Energy			622		μJ
E_{OFF}	Turn Off Energy			121		μJ
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 800\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = -5/+18\text{ V}$, $R_{G,EXT} = 2.5\ \Omega$ $L = 40\text{ nH}$ Diode: Body Diode at $V_{GS} = -5\text{V}$ $T_J = 175\text{ }^\circ\text{C}$		12		nS
T_R	Rise Time			11		nS
$T_{D(OFF)}$	Turn Off Delay Time			70		nS
T_F	Fall Time			19		nS
E_{ON}	Turn On Energy			944		μJ
E_{OFF}	Turn Off Energy			182		μJ

Drain-Source Diode Characteristics ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)

I_S	Maximum Continuous Drain-Source Diode Forward Current			76	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current			120	A
V_{SD}	Diode Forward Voltage	$V_{GS} = -4\text{ V}$, $I_{SD} = 20\text{ A}$		4.9	V
		$V_{GS} = -4\text{ V}$, $I_{SD} = 20\text{ A}$, $T_J = 175\text{ }^\circ\text{C}$		4.4	V
I_{RM}	Peak Reverse Recovery Current	$V_{GS} = -4\text{ V}$, $I_{SD} = 40\text{ A}$, $V_R = 800\text{ V}$, $di/dt = 1150\text{ A}/\mu\text{S}$		14.8	A
T_{RR}	Reverse Recovery Time			24	nS
Q_{RR}	Reverse Recovery Charge			181	nC
I_{RM}	Peak Reverse Recovery Current	$V_{GS} = -4\text{ V}$, $I_{SD} = 40\text{ A}$, $V_R = 800\text{ V}$, $di/dt = 1150\text{ A}/\mu\text{S}$ $T_J = 175\text{ }^\circ\text{C}$		21.4	A
T_{RR}	Reverse Recovery Time			46.5	nS
Q_{RR}	Reverse Recovery Charge			512	nC

Electrical Characteristics Diagrams (Note4)





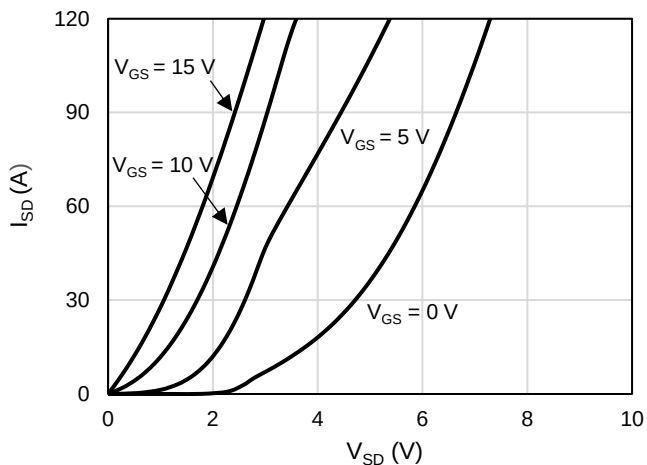


Figure 13: 3rd Quadrant Characteristics at -40°C

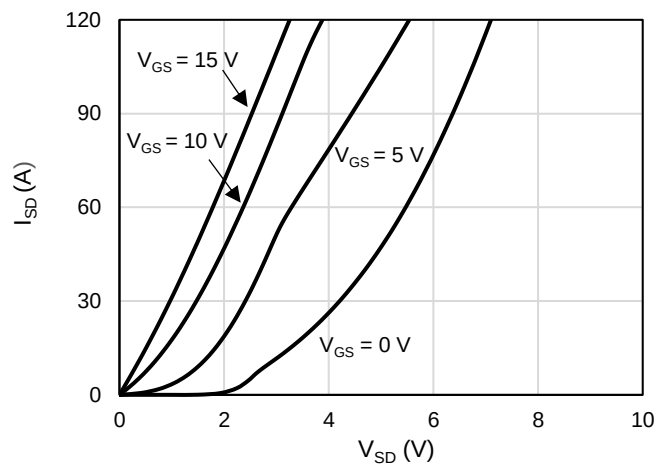


Figure 14: 3rd Quadrant Characteristics at 25°C

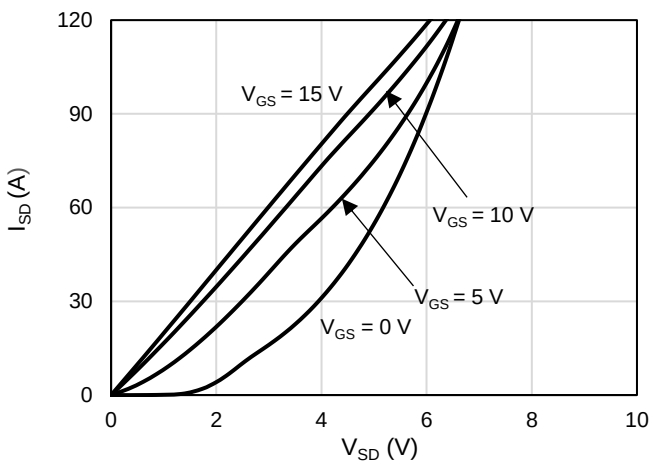


Figure 15: 3rd Quadrant Characteristics at 175°C

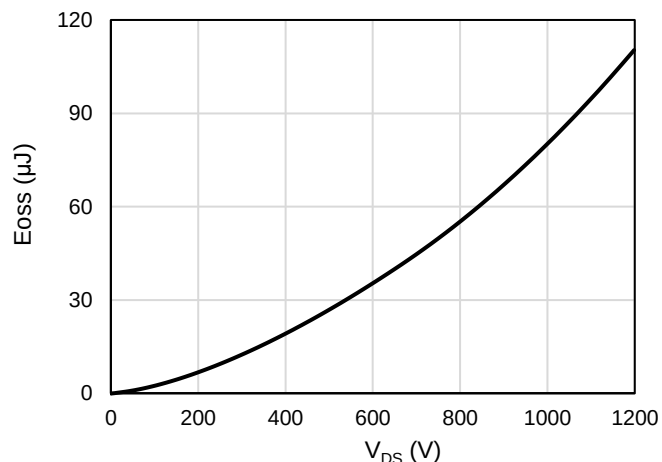


Figure 16: Output Capacitor Stord Energy

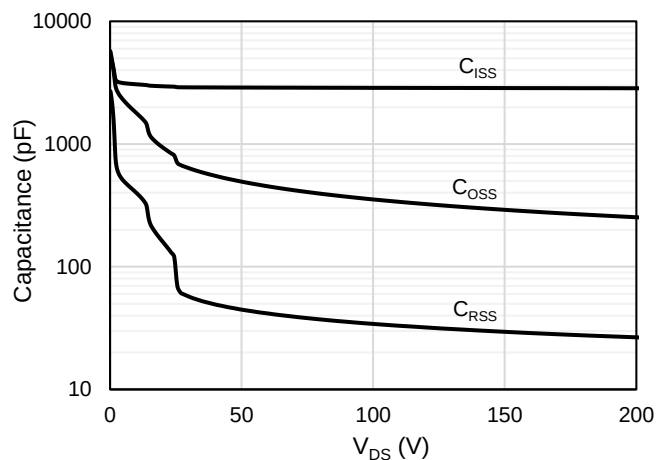


Figure 17: Capacitance Characteristics (0 - 200V)

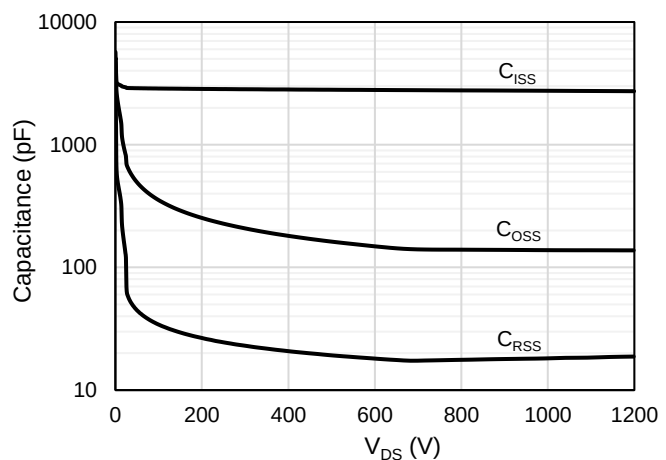


Figure 18: Capacitance Characteristics (0-1200V)

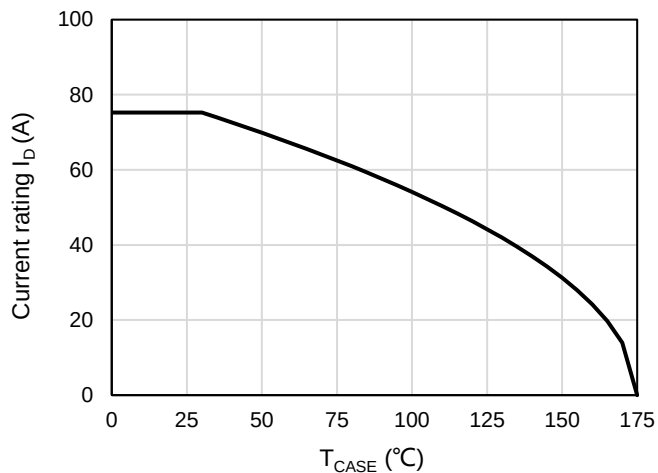


Figure 19: Current De-rating

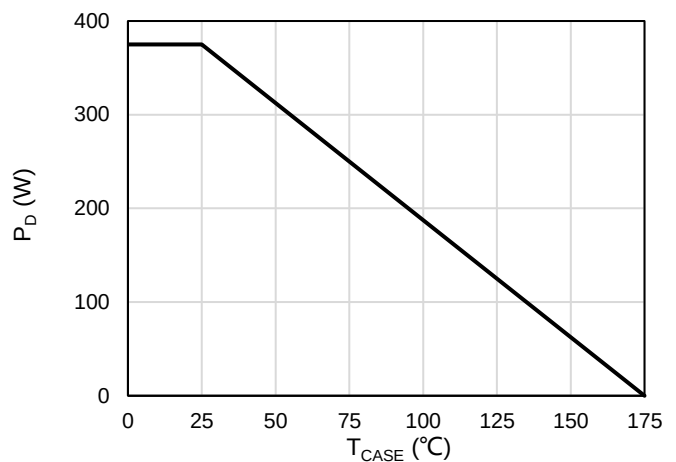


Figure 20: Maximum Power Dissipation Derating vs Case Temperature

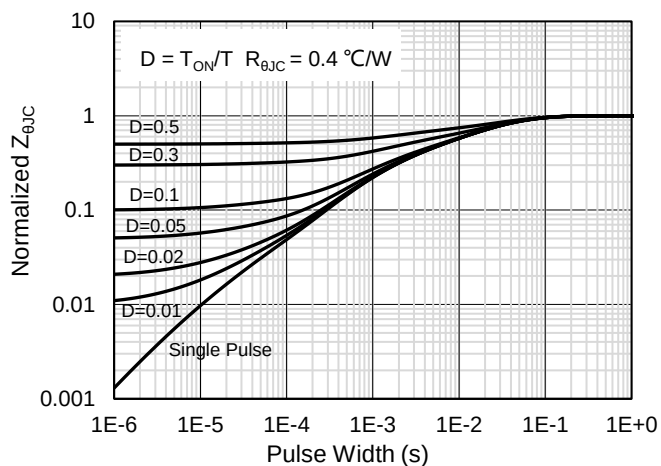


Figure 21: Normalized Maximum Transient Thermal Impedance

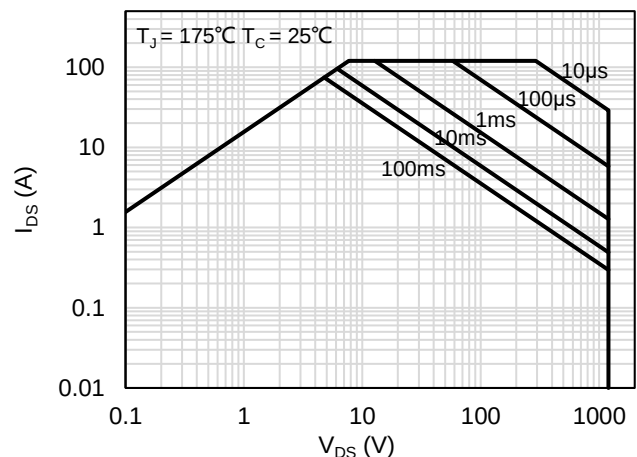


Figure 22: Maximum Forward Biased Safe Operating Area

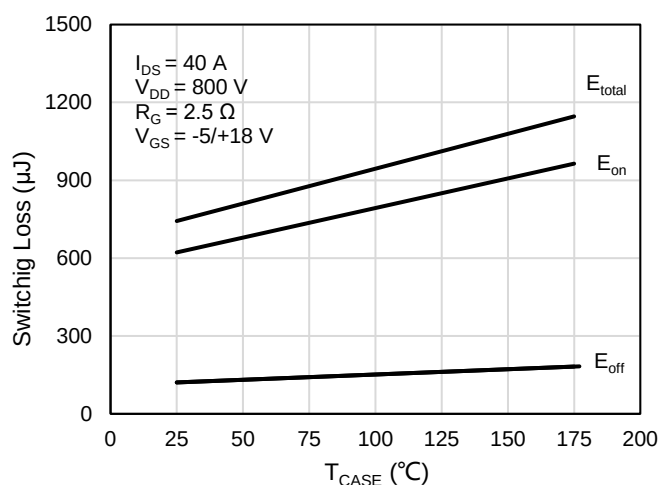
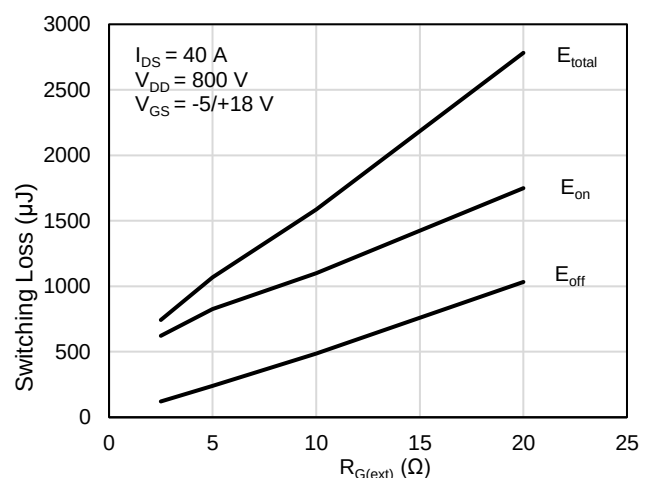
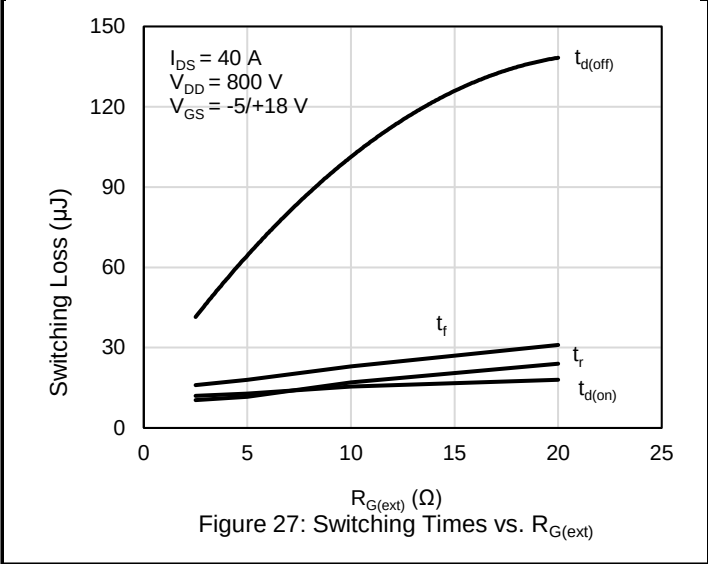
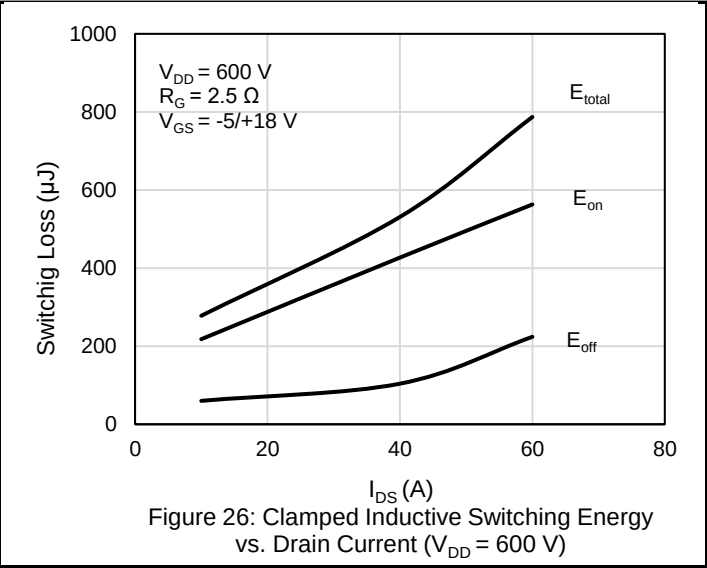
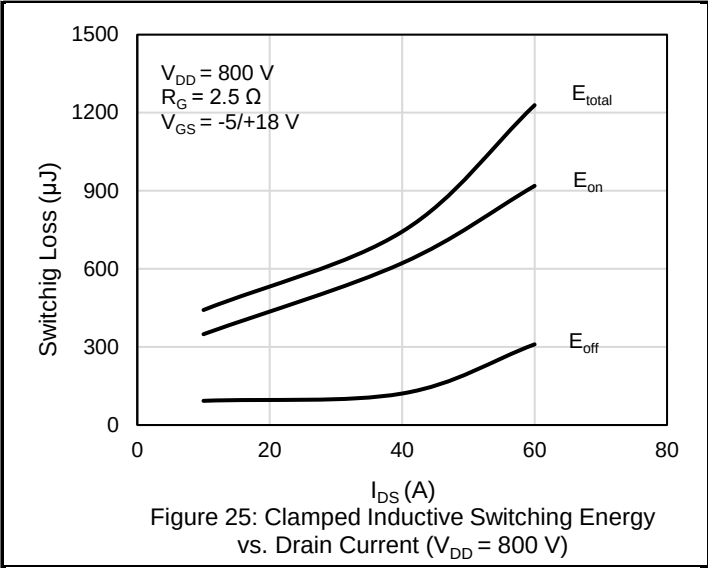


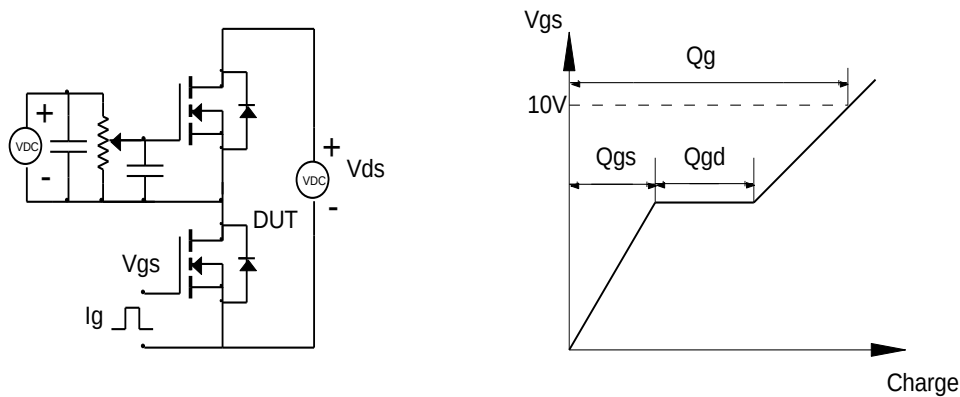
Figure 23: Clamped Inductive Switching Energy vs. Temperature

Figure 24: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

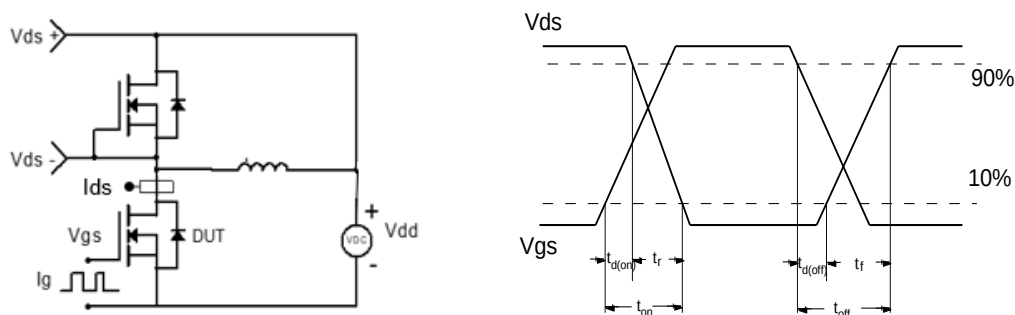


Test Circuit and Waveform

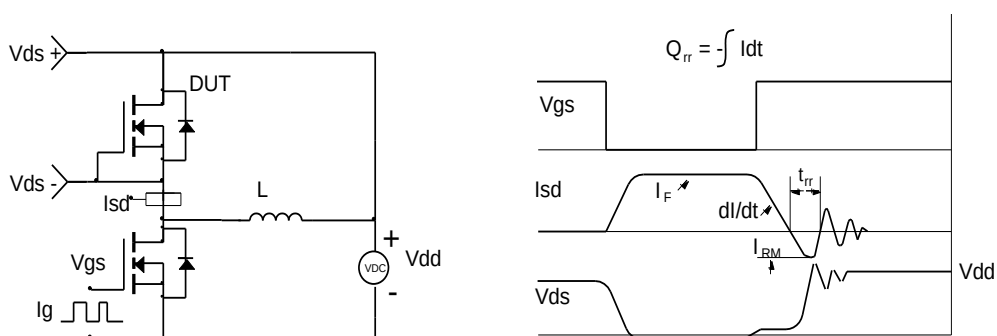
Gate Charge Test Circuit & Waveform



Clamped Inductive Switching Test Circuit & Waveforms

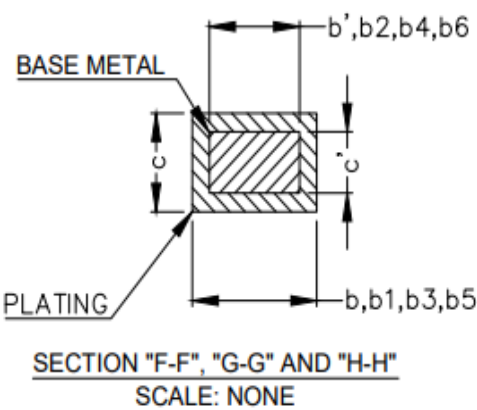
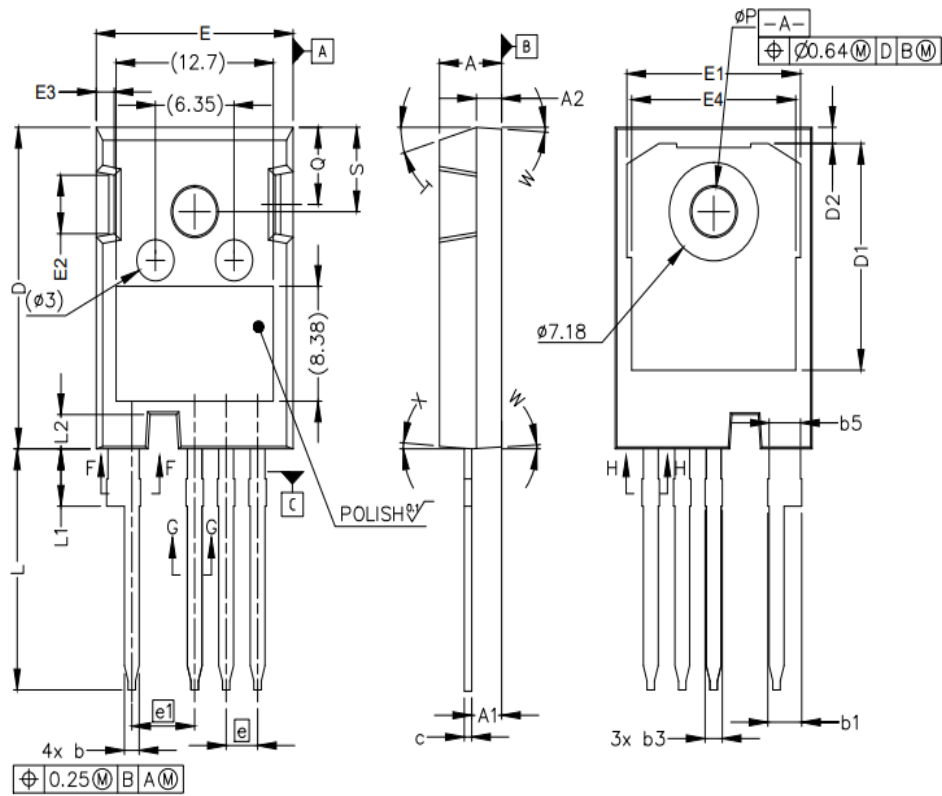


Diode Recovery Test Circuit & Waveforms



Package Outlines

TO-247-4L PKG Outlines



SYMBOL	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	

Marking Information



Note:

CK2M030WAMH = Product Name Code

XXXXXXX = Date Code

Contact ALKAIDSEMI sales for detail information

Revision History

Revision	Release Date	Remark
Rev.1.8	2023/8/17	

Disclaimer

The information given in this document describes the independent performance of the product, but similar performance is not guaranteed under other working conditions, and cannot be guaranteed when installed with other products or equipment. To achieve the required performance of the product in actual scenarios, the customer should conduct a complete application test to assess the functionality of the product.

Alkaidsemi assumes no responsibility for equipment failures result from using products at values that exceed the ratings, operating conditions, or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which requires high reliability. Customers using or selling these products for use in medical, life-saving, or life-sustaining applications do so at their own risk and agree to fully indemnify.

Due to product or technical improvements, the information described or contained herein may be changed without prior notice.